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Feeding and Management of Horses

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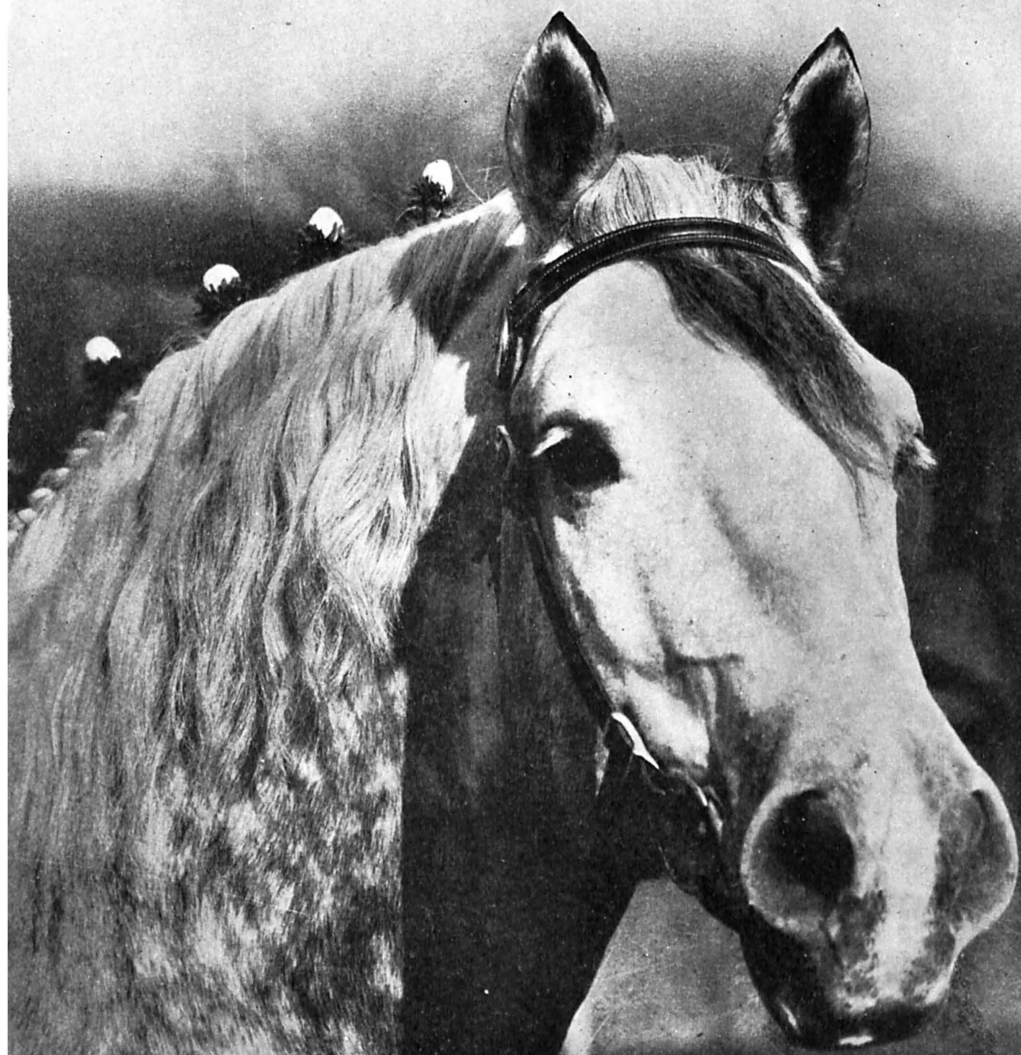
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Feeding & Management of Horses

By A.B. CAINE



AGRICULTURAL EXPERIMENT STATION
IOWA STATE COLLEGE OF AGRICULTURE
AND MECHANIC ARTS

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ANIMAL HUSBANDRY SECTION

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Feeding and Management of Horses

BY A. B. CAINE

The successful feeding of horses requires a knowledge of the composition of the common feeding stuffs, the requirements of horses under various conditions and their proper management. Those who have studied horse feeding problems generally concede that considerable feed may be saved by the proper use of the various feeds and an up-to-date system of management. Surveys have shown that some horses, even tho they get twice as much feed as others, do no more work and are kept in no better condition. This can be explained by the fact that one farmer understands how to feed and care for his animals, while the other simply wastes feed because he does not know the amount and the kind needed.

Many farmers and breeders half starve colts in an attempt to save feed. This, however, is false economy as it results in a small horse at maturity—a cheap product. The colts should be fed liberally to secure all the growth possible for the first year. Economy should come from the proper feeding of horses of all ages. Overfeeding, especially of roughage, is nearly as common among feeders as underfeeding. The two practices are equally faulty.

Present knowledge of horse feeding has been derived largely from practical horsemen because of lack of experimental data with horses. The kind of work which horses are compelled to do and the expense involved are no doubt responsible for the limited amount of scientific data available at present.

COMPOUNDS OF NUTRITION

All feeds contain the compounds protein, carbohydrates, fats and ash in various amounts, and their value is determined largely by the percentage they contain of each of these nutrients.

Proteins are the nitrogenous portions of the plants and are made up of carbon, hydrogen, oxygen, nitrogen, sulfur and occasionally phosphorus. Usually the protein portion of the ration is the most expensive, but can be supplied in ample amounts by choosing the right kinds of feeds. Proteins are used to build and repair muscles, blood and other protein tissue, altho when a surplus is fed it can be used to furnish energy. Carbohydrates, composed of three elements carbon, hydrogen and oxygen, are sub-divided into crude fiber and nitrogen-free-extract. Crude fiber is the material found in the woody part of the plant, and nitrogen-free-extract is represented by the

sugars and starch present in the feed. Their function is to furnish energy to the body, energy necessary for the body functions, and third to supply energy for the work performed. When horses are put to work before they are fully matured, the feed is called upon to perform a fourth function, that of providing nutrients for growth. In every case the first two functions, as far as possible, are satisfied before the last two receive any portion of the feed. This explains the necessity for supplying an adequate ration or the animal will lose weight.

PROPERTIES OF AN ADEQUATE RATION*

(1) **Variety.** All rations as far as possible should be made up of several feeds rather than of a single one. The use of a number of feeds makes it possible to balance rations as regards all the nutrients contained in them. Variety is also advantageous because it usually makes the ration more palatable than where only one or two feeds are used.

(2) **Palatability.** A good ration must be palatable or horses may not eat enough to maintain their weight, especially when at work. Horses are particular about their feed and often refuse to eat unpalatable feeds. Only the kinds of hay and grain that are relished by horses should be offered them, because if the feeds are not thoroly masticated when eaten they probably will not be completely digested.

(3) **Bulk.** While horses have a very limited digestive system, a certain amount of bulk is necessary to insure complete digestion. Highly concentrated feeds that have a tendency to mass in the stomach can be safely used by mixing them with bulkier feeds. This makes it possible for the digestive juices to become thoroly mixed with all the ration and aids digestion. On the other hand, too bulky feeds are not usually handled by working horses very efficiently because of the lack of digestive power and the large amount of energy required to digest them.

(4) **Effect Upon the Animal.** Some feeds that would meet the nutritive requirements are injurious to horses. If fed in very large amounts they may cause colic or founder, while others often affect their legs. Swelling in the hocks and puffing about the rear ankles are usually signs that the ration is too rich for the particular animal. Wheat and rye must be fed with discretion to all classes of horses.

(5) **Balance of Nutrients.** A good ration must have the proper proportions between the digestible nutrients, protein, carbohydrates, fats and ash. These requirements may vary with each individual, but to obtain the best results the ration should be balanced or practically so. Each nutrient performs

*"Feeds and Feeding," 18th Edition, by Henry and Morrison.

certain definite functions and if fed in excess there is a waste, while if fed in insufficient amounts there may be a loss in weight. No doubt many of our best horse men are feeding rations that are practically balanced, but they do not realize it. Experience has taught them how to get the most out of the available feeds.

FEEDING STANDARDS AND FEED REQUIREMENTS FOR HORSES*

Table I, taken from Henry and Morrison's "Feeds and Feeding," shows the amount of each of the various nutrients required by a horse when idle and when doing work of various kinds. The table is based on 1,000 pounds of live weight, but can be used to calculate rations for horses of any weight.

TABLE I. FEED REQUIREMENTS OF HORSES

	Per day per 1,000 lbs. live weight			Nutritive ratio
	Dry matter	Digestible crude protein	Total digestible nutrients	
	Lbs.	Lbs.	Lbs.	
Idle	13.0-18.0	0.3-1.0	7.0- 9.0	1:8.0-1:9.0
At light work	15.0-20.0	1.0-1.2	9.0-11.0	1:8.0-1:8.5
At medium work	16.0-21.0	1.2-1.5	11.0-13.0	1:7.8-1:8.3
At heavy work	18.0-22.0	1.5-1.8	13.0-15.0	1:7.6-1:8.1
Brood mares suckling foals, but not at work	15.0-22.0	1.2-1.5	9.0-12.0	1:6.5-1:7.5
Growing colts over six months	18.0-22.0	1.6-1.8	11.0-13.0	1:6.0-1:7.0

While table I may not be absolutely correct for every horse, yet it is a guide that can be used for general conditions with very satisfactory results. It should be noticed that the mature idle horse does not require nearly as much digestible crude protein as a mare suckling a foal, or a colt over 6 months old. A ration that is sufficient for the idle horse is not adequate for the brood mare or colt, while if the idle horse is fed a ration containing as much protein as the colt requires, the ration would be wasteful and expensive.

Feed requirements of horses depend upon their age, character of work performed, size, season of year and individuality of the animals.

(6) Cost of Ration. This is an especially important item since about 70 to 75 percent of the total expense of keeping horses can be charged to feed. As far as practicable, home-grown feeds should be used because they usually can be produced cheaper than they can be bought. Under some conditions the addition of a small amount of bran, linseed meal or

*From "Feeds and Feeding," 18th Edition, by Henry and Morrison, page 748.

other commercial feeds may justify the expenditure, but when oats, alfalfa and clover are available a high protein concentrate like oilmeal is not needed. Every farmer should plan his system of farming to produce enough high class horse feed each year to feed adequately all the horses kept on the farm. One advantage of keeping horses on the farm is that they can be fed on home-grown feeds and no great cash outlay is required.

COMMON FEEDS FOR HORSES

It is evident from the number of feeds used in various parts of the country that horses will consume a great variety. This is one reason why horses are so useful under a wide range of conditions. Such factors as soil, climate and water are important from the standpoint of feeding and production of feeds. The character of the soil influences the feeding value of both hay and grain, but in general what can be said of oats and corn in one section holds true in any other part of America.

For convenience table II showing the feeding value of some of the common feeds is given.

TABLE II. AVERAGE DIGESTIBLE NUTRIENTS IN 100 LBS. COMMON FEEDING STUFFS*

Feeding stuff	Total dry matter in 100 lbs.	Digestible nutrients in 100 lbs.				Nutritive ratio
		Crude protein	Carbohydrates	Fat	Total	
Concentrates	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	
Barley, common	90.7	9.0	65.8	1.6	79.4	7.8
Corn, dent, well-cured	89.5	7.5	67.8	4.6	85.7	10.4
Corn, dent No. 2	85.2	7.1	64.6	4.4	81.7	10.4
Corn, flint	87.8	7.7	66.1	4.6	84.2	9.9
Corn, soft (immature)	69.4	5.5	53.3	3.5	66.7	11.1
Corn and cob meal	89.6	6.1	63.7	3.7	78.1	11.8
Kafir grain	88.2	9.0	65.8	2.3	80.0	7.9
Oats	90.8	9.7	52.1	3.8	70.4	6.3
Oats (lightweight)	91.3	9.6	49.5	4.1	68.3	6.1
Rye						
Soybean seed	90.1	33.2	24.7	16.1	94.1	1.8
Wheat, all analyses	89.8	9.2	67.5	1.5	80.1	7.7
Corn gluten feed	91.3	21.6	51.9	3.2	80.7	2.7
Cottonseed meal (choke)	92.5	37.0	21.8	8.6	78.2	1.1
Linseed meal (new process)	90.4	31.7	37.9	2.8	75.9	1.4
Molasses (beet)	78.0	2.9	55.8		58.7	19.2
Molasses (cane or blackstrap)	74.3	1.0	58.5		59.5	58.5
Molasses (alfalfa feeds)	86.5	8.5	41.0	0.5	50.6	5.0
Soybean oilmeal	89.5	39.7	34.7	4.5	84.5	1.1
Wheat bran (all analyses)	89.9	12.5	41.6	3.0	60.9	3.9
Wheat middlings standard (shorts)	89.5	13.4	46.2	4.3	69.3	4.2
Corn fodder (medium in water)	81.7	3.0	47.3	1.5	53.7	16.9
Corn stover (ears removed) very dry	90.6	2.2	47.8	1.0	52.2	22.7
Bluegrass (Kentucky) all analyses	86.8	4.7	43.5	1.5	51.6	10.0
Brome grass, smooth	91.5	5.0	44.2	0.9	51.2	9.2
Johnson grass	89.9	2.9	45.0	1.0	50.1	16.3
Millet, common	85.7	5.0	46.0	1.8	55.0	10.0

*From "Feeds and Feeding," 18th Edition, by Henry and Morrison, pp. 728-743.

TABLE II. AVERAGE DIGESTIBLE NUTRIENTS IN 100 LBS. COMMON FEEDING STUFFS—Continued

Feeding stuff	Total dry matter in 100 lbs.	Digestible nutrients in 100 lbs.				Nutritive ratio
		Crude protein	Carbohydrates	Fat	Total	
Concentrates	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	
Orchard grass	88.4	4.7	41.1	1.6	49.4	9.5
Prairie hay, western	93.5	4.0	41.4	1.1	47.9	11.0
Red Top, all analyses	90.2	4.6	45.9	1.2	53.2	10.6
Rye grass, perennial	88.0	4.4	39.0	1.6	47.0	9.7
Sudan grass	88.4	3.7	45.7	0.9	51.4	12.9
Timothy, all analyses	88.4	3.0	43.3	1.2	48.5	15.2
Barley hay, common	92.6	4.6	48.3	0.9	54.8	10.9
Oat hay	88.0	4.5	38.1	1.7	46.4	9.3
Alfalfa, all analyses	91.4	10.6	39.0	0.9	51.6	3.9
Clover, alsike	87.7	7.9	36.9	1.1	47.3	5.0
Clover, red	86.1	8.1	38.3	1.3	50.9	5.3
Clover, white	91.9	11.8	43.3	1.5	56.5	4.0
Soybean hay	91.4	11.7	39.3	1.2	53.6	3.6
Cowpeas, all analyses	90.3	13.1	33.7	1.0	49.0	2.7
Clover and timothy	87.8	4.0	39.7	1.1	46.2	10.6
Barley straw	85.8	0.9	40.2	0.6	42.5	46.2
Oat straw	88.5	1.0	42.6	0.9	45.6	44.6
Wheat straw	91.6	0.7	35.1	0.5	36.9	51.7
Carrots	11.7	1.0	9.1	0.2	10.6	9.6
Mangels	9.4	0.8	6.4	0.1	7.4	8.2
Rutabagas	10.9	1.0	7.7	0.2	9.4	8.4
Turnips	9.5	1.0	6.0	0.2	7.4	6.4
Corn silage	26.3	1.1	15.0	0.7	17.7	15.1

A brief statement regarding the adaptability of various feeds from the standpoint of the horse feeder is listed herewith.

CONCENTRATES

Oats

The standard grain for horses wherever grown. The oat kernel is encased in a hull which makes it especially well adapted for horses as the hull usually insures complete digestion. Oats are fairly well balanced, containing about the correct amounts of protein, carbohydrates and fats. They can be used safely for all classes of horses, including both work and breeding horses, and are valuable for fitting horses for show or sale.

They can be used as the entire grain ration or fed successfully in combination with almost any natural or commercial feed.

Under some conditions grinding or rolling grain may be advisable, but for average use the whole grain is satisfactory. The question regarding the grinding or rolling of oats is: Will the results justify the expense?

The amount of oats to feed depends upon the price and the value of other grains that may be substituted. Amounts vary-

ing from one-fourth of the entire grain ration are successfully used by feeders. For average feeding a pound of oats for each 100 pounds of live weight is ample, but for some horses it may be necessary to feed as high as 1.3 pounds for each 100 pounds live weight.

Corn

This is a highly carbonaceous concentrate that is extensively used as a horse feed in the Corn Belt. Pound for pound it furnishes more energy than oats but is not considered as safe a feed as oats because it is more concentrated and not so easy for horses to digest. The high carbonaceous content of corn furnishes a great amount of energy and heat in the body. Because of this many horsemen do not like to feed much corn as they claim that the heat "burns out" a horse. When corn is fed in summer, it should not comprise more than one-half the grain ration. Larger amounts can be fed during the winter months when it is cold, but during the summer the corn allowance should be limited. Where corn is used for work horses, it should be fed in conjunction with a nitrogenous roughage such as clover, alfalfa or soybean hay. Under average Iowa conditions corn should always constitute a part of a work horse's ration.

The protein in corn is not of the best quality, and when corn is fed to growing animals it should be supplemented by a high protein feed.

The mineral content of corn is low. Therefore, feeds that will supply a liberal amount of ash, especially calcium and phosphorus, should be fed with corn. Legume hays are excellent to feed with corn and will supply not only protein but considerable ash as well. Alfalfa would furnish ample calcium but not enough phosphorus.

Barley

Barley is another carbonaceous concentrate that is used in many sections as part or all of the grain ration for horses. Its value is not so high as corn or oats, but it can be used to good advantage and is a safe feed. It is not so heating as corn, but it is more concentrated than oats. Barley is very hard and some preparation is needed to get the greatest good from it. Rolling is the best preparation, with crushing nearly as satisfactory, while grinding, especially when too fine, seems to make the feed too hard to digest. Barley can also be soaked for a few hours to good advantage. It is difficult, however, to prepare barley in this way in the winter because of freezing. The feed can be placed in a barrel and water poured over it. Allowed to soak from one feeding period to the next, the grain is much softer and can be handled satisfactorily by horses. The soaked grain is difficult to feed. Rolled or crushed barley is to be preferred,

but if it is not possible to have the feed prepared at a reasonable cost, soaking may be resorted to.

Wheat

Usually wheat is too expensive to be fed to horses. It could be used only to replace feeds that have as high or higher feeding value, and these other feeds are usually cheaper. Wheat seems to be a difficult feed for horses to digest, and when it is fed extensively colic and founder are common. Wheat is carbonaceous, and gives best results when supplemented with a nitrogenous grain or hay. For most conditions, even if the price warrants it, it seems best that not more than one-half the grain ration consist of wheat.

Soybeans

Soybeans have not been extensively used, but when fed they have given satisfactory results. They are very concentrated and must be fed in limited amounts. They are a high protein feed and can be used with a carbonaceous grain or roughage. With corn and timothy hay, an addition of about 5 percent of ground soybeans would make the ration more effective. Soybeans are rather hard and horses sometimes refuse to eat them unless they are ground or crushed. Ground soybeans are difficult to store, especially in the summer, because they contain so much oil. The



Fig. 1. An eight-horse multi-hitch on a three-bottom plow—an efficient unit for plowing.

oil may become rancid if too large amounts of the beans are stored too long. The warmer the weather the greater the likelihood of the feed spoiling. More general use of soybeans or soybean oilmeal can be expected in the future as farmers become better acquainted with their feeding value.

Kafir

This carbonaceous concentrate is extensively used for horse feeding in certain sections. Not so valuable as corn, it requires special preparation because of its small, hard seeds. Best results are obtained when kafir is mixed with wheat bran or ground or crushed oats.

Rye

Rye is used only in a limited way as a horse feed. It seems to be hard for horses to digest and, consequently, in the hands of an inexperienced feeder is not so safe as some other concentrates. When the price permits, it might be used up to 15 or 20 percent of the grain ration. It gives best results when fed with some bulky feeds such as oats or bran, or mixed with chaffed hay.

Emmer or "Speltz"

This feed is not commonly used in Iowa as it is not grown very extensively in this section. Emmer is somewhat like oats since the grain kernel is inclosed in a hull which comprises about 21 percent of the total weight. This grain is slightly lower in protein, but somewhat higher than oats in carbohydrates. As a horse feed it compares favorably with barley, but is probably not so easily digested. For best results some bulky feed like bran, or even oats, should be mixed with it. When fed, emmer should be gradually introduced into the ration until the horse becomes accustomed to it.

Wheat Bran

A bulky, protein-rich concentrate that is very valuable in the feeding of all kinds of horses. For most cases the use of home-grown feeds is advocated, but the addition of a small amount of bran often materially improves the ration. Bran is a cooling, laxative feed that can be mixed with the regular grain ration or fed in the form of a mash. It is too bulky to feed in large amounts, but for limited feeding and to keep a horse's digestive system in good condition, bran is excelled by few, if any, feeds. The substitution of bran for a large part of the regular grain ration on workless days is a practice followed by many successful horsemen.

Bran is also a valuable feed to use for mares before and after foaling, for stallions during the entire year, unless they are allowed the use of a pasture during the summer. When horses



Fig. 2. Four big, well-fed horses capable of performing hard work day after day.

that have wintered out are being prepared for spring work, a little bran mixed with the grain serves a valuable purpose. It seems to keep the digestive system in good condition and also causes the long, shaggy hair coats to shed quickly. For any horses it is not necessary to feed more than 10 percent bran unless on workless days when the more concentrated grains should be reduced to at least one-third, or better still, one-half the usual allowance. Then a greater percentage of bran can be fed.

Bran mashes are frequently given to horses with splendid results. Many horsemen make a practice of giving a bran mash every Saturday night, or the night before any workless day unless their teams are turned on grass. A better practice could not be followed. The mash acts as a mild laxative, is cooling and very satisfying to the horse, and prevents many cases of colic or even azoturia.

A mash is made of about 2 quarts of bran mixed with enough water to make the mash like a thick gruel. To make the mashes more laxative, use enough boiling water to wet thoroly and steam the bran, cover the bucket and allow to stand for 15 or 20 minutes, then add cold water and obtain the consistency desired.

Linseed Meal

A nitrogenous concentrate that serves a very useful purpose in horse feeding. Because of its high protein content it can be

fed with carbonaceous grains or roughages. It is somewhat laxative and can, therefore, be fed with feeds that are constipating. Oilmeal is quite extensively used in getting horses in shape for spring work, especially those that have been running out in cornfields and are very poor. It seems to act as a tonic in that it causes early shedding of long, coarse hair, gives life to the skin, improves the general appearance and puts on fat.

Because of its concentration of nutrients, laxative tendencies and cost, only small amounts of oilmeal are fed. Usually not more than 1 to 1½ pounds daily mixed with the grain are fed. Some feeders do not bother to weigh the meal but just make a practice of adding a small handful once or twice a day.

Linseed meal is not always palatable to horses, but few of them refuse to eat it if it is mixed with the grain. They soon develop an appetite for it. It is a valuable feed for fitting horses for show, sale or market. It produces a glossy hair coat so much desired in exhibition and sale animals.

Cottonseed Meal

A highly nitrogenous concentrate used quite extensively in the South for feeding mules and horses. It is not especially palatable and is thought to contain a poisonous substance that is often injurious to horses. It should be limited to not more than 1 pound daily for a 1,000-pound horse, and best results are obtained when it is fed with a laxative feed. In the South, the animals that are fed cottonseed meal are usually turned on grass and its succulence seems to offset some of the ill effects of the meal. It is a good plan not to buy too much cottonseed meal as it may spoil if kept too long. Only fresh meal should be fed as the moldy feed is likely to cause serious digestive troubles. Its use for pregnant mares may be questioned. In some cases equal parts of cottonseed meal and linseed meal have been used with more satisfactory results than when cottonseed meal was fed alone. The laxative nature of the linseed meal helps the other feed.

In an experiment conducted by Iowa Agricultural Experiment Station and reported in Bulletin 109, Kennedy, Robbins and Kildee found that: "Cottonseed meal gave somewhat better results on the whole than oilmeal. The ration containing it was fully as palatable and as efficient in maintaining the health and weight of horses, it was less laxative and a little cheaper with cottonseed meal at \$30.00 a ton." Further they found: "The health, spirit and endurance of work horses were the same when fed corn with a moderate amount of oilmeal, or gluten feed or cottonseed meal as when fed a corn and oats ration supplying a similar nutritive ratio."

The price of cottonseed meal has materially increased over the



Fig. 3. Three horses hitched to two-row cultivators reduces the time required to plow corn.

price quoted in Bulletin 109, but the results show that this feed can be successfully used when used judiciously.

ROUGHAGES

Timothy

One of the most commonly used roughages in horse feeding is timothy hay. It is regarded as the standard by which all other roughages are compared. It is probably the safest hay that can be fed to horses, and because of this it is widely used. Timothy is a carbonaceous feed being fairly rich in carbohydrates and fats but lacking in digestible protein and minerals. Whenever this hay is fed, special care should be taken to add protein and minerals to the ration in some other feeds. Oats, bran, soybeans, linseed meal or cottonseed meal are valuable protein feeds to use with timothy, while alfalfa, clover or soybean hay are roughages that will help to balance timothy.

Timothy has long been a favorite of horsemen, especially city users, because the hay is usually free from dust and mold. It is not a "washy" feed, which is regarded as an advantage for city horses. For saddle, show and race horses, timothy is considered the most valuable roughage obtainable.

From the Iowa farmers' point of view, there are several drawbacks to this feed:

- (1) It is not a heavy yielding feed and is hard on the soil.
- (2) Timothy is not a very desirable roughage with corn as both feeds lack in quantity and quality of protein and minerals.
- (3) Timothy is not very well adapted to the feeding of colts, brood mares and stallions, tho it is safe to use.
- (4) Timothy is not suited to needs of other classes of stock such as beef or dairy cattle, or sheep.

Experience and experiments have shown that other roughages that yield more per acre, build up soil fertility and are better suited to balancing corn can be used on the farms for all classes of horses.

Alfalfa

This is probably the most palatable of all hays for horses and is well suited for all horses when fed judiciously. It is a feed high in digestible protein and some minerals. It is especially well suited to feed with corn, barley or oats because of its protein content. It is a high yielding feed and one that builds up soil fertility. Another factor of importance is that alfalfa can also be used for other classes of stock, while some of the other roughages are not so well suited for cattle or sheep.

In feeding alfalfa, care must be taken not to overfeed. It is very palatable and horses will eat more than they should if given an opportunity. A good rule to follow is 1 pound of hay



Fig. 4. A hay loader saves time in harvesting alfalfa. This legume hay is a splendid feed for horses.

for each 100 pounds of live weight daily. If more roughage is needed, add straw, prairie hay, timothy or any other non-leguminous hay.

Alfalfa, like any other leafy plant, may become dusty when cured. This is objectionable because the dust may irritate the nasal passages of horses. In case the hay is dusty, it should be moistened before feeding. Spread the hay out over the floor, fill an ordinary sprinkling can with water and sprinkle the alfalfa. Practically all dust can be eliminated this way.

Alfalfa that is cut when fairly mature seems to be best suited for horses. It is not so laxative as the hay cut when less mature. If alfalfa is used for all classes of livestock, however, it is a good practice to cut the hay when it will make the best feed for the largest number of animals.

In feeding alfalfa hay to horses there are three precautions:

(1) Limit the amount fed to about 1 pound per day for each 100 pounds of live weight.

(2) Use hay that is as free from dust as possible.

(3) If the alfalfa is for horses alone, cut it when it is fairly mature.

The acreage of alfalfa in Iowa is increasing yearly and should be. Alfalfa is well suited for all classes of stock, especially if fed with corn.

Timothy vs. Alfalfa

To determine the efficiency of these roughages when fed with a grain ration of 50 percent oats and 50 shelled corn (yellow) by weight, three teams (four mules and two horses) were placed on experiment. One horse or mule in each team was fed alfalfa and the other one timothy. The teams were used for all types of farm work and also did some hauling of grain, hay and livestock between town and the college, a distance of two miles.

Weights were taken at the beginning and end of each period and also every 30 days. All animals were in good working condition when the trial began.

The length of the feeding periods was 150 days. At the end of the first period the animals that had been receiving timothy were fed alfalfa during the next period, and the alfalfa-fed animals were changed to timothy. This was done to find out what effects, if any, the individuality of horses or mules had on the results.

Salt was fed at regular intervals and all were watered in the same trough before and after each feed when working.

All feeds used were of good quality, having been produced on the college farm or on farms nearby. A bran mash was fed each Saturday night in place of the regular grain ration. The horses and mules were all housed in the same barn in stalls of the same size and as nearly as was possible with teams that were doing various kinds of work, they were handled the same.

The work, however, was somewhat lighter during the last month. The same teamsters drove the same teams during the entire experiment.

Table III gives the results of the feeds consumed and the loss or gain in weights.

TABLE III. COMPARISON OF TIMOTHY AND ALFALFA HAY FOR HORSES

1st Period 150 Days—March 4 to July 31, 1927

	Favorite Beas Molly	Peggy Daisy Kate
Average initial weight	1,428.44 lbs.	1,487.55 lbs.
Average final weight	1,437.67 lbs.	1,459.67 lbs.
Loss or gain per horse or mule.....	+9.23 lbs.	-27.88 lbs.
Average daily feed:		
Grain (50 percent oats, 50 percent corn).....	12.66 lbs.	13.38 lbs.
Alfalfa hay	16.68 lbs.	
Timothy hay		18.07 lbs.

2nd Period 150 Days—Aug. 4 to Dec. 31, 1927

	Favorite Beas Molly	Peggy Daisy Kate
Average initial weight	1,437.67 lbs.	1,459.67 lbs.
Average final weight	1,396.50 lbs.	1,483.00 lbs.
Gain or loss per horse or mule.....	-41.17 lbs.	+24.67 lbs.
Average daily feed:		
Grain (50 percent oats, 50 percent corn).....	10.55 lbs.	10.86 lbs.
Alfalfa hay		18.76 lbs.
Timothy hay	19.23 lbs.	

During the first period the animals receiving alfalfa gained 9.23 pounds per head, while those fed timothy lost an average of 27.88 pounds, an actual difference of 37.2 pounds in favor of the alfalfa group. There was a saving of 5.38 percent in the daily grain consumption and 7.69 percent in roughage.

During the second period when the rations were reversed the results were very much like the first period. The alfalfa fed group gained 24.67 pounds per head, while those that had been fed alfalfa and then changed to timothy lost 41.17 pounds, or there was a difference of 65.84 pounds in favor of the alfalfa-fed group. The feed consumption was practically the same for both groups. The average amount of grain fed daily was less than in the first period, due to the fact that the work was lighter during the fall and late winter and the grain ration was reduced. The hay was consequently increased. In this period one animal fed timothy was not worked quite as regularly as the

others, which actually accounts for the fact that the timothy-fed group averaged less grain per day than the others.

There was an additional advantage in favor of alfalfa that could not be actually measured. The horses and mules receiving alfalfa looked much better than did those being fed timothy. Those fed alfalfa were, of course, gaining in weight while the others were losing weight, and the hair coats of the alfalfa-fed animals were much glossier and shorter. It was a case of animals gaining in weight because of being well fed, while others were not able to maintain their weight.

At no time during the trial was there any indication that alfalfa caused ill effects. The animals worked just as well as the others, and if appearances are any indication of the well-being of an animal the alfalfa-fed animals had an advantage.

It is quite essential not to overfeed with alfalfa. Fifteen or sixteen pounds of alfalfa looks to be much less than the same weight of timothy. A feeder who simply measures his feeds by the capacity of the manger would feed too much alfalfa. The drivers of the teams used in this experiment felt that the animals fed alfalfa were not getting enough roughage. This, however, was not correct as was shown by the gains made by the animals fed alfalfa.

Not enough animals were used to make this trial conclusive, but it indicates that alfalfa is a more efficient roughage for work horses than timothy.



Fig. 5. Cutting a heavy field of alfalfa. A good team will cut 10 acres per day. (This team was used in the mineral feeding experiment.)

Clover Hay

This hay ranks next to alfalfa in value for horses. It is palatable, slightly laxative and has a fairly high protein content. It is well suited to the feeding of horses of all ages that receive considerable corn or other carbonaceous grains as part of the ration. Clover is sometimes rather dusty but can be safely used if sprinkled before it is fed. In curing clover hay for horses, care should be taken to get the hay in the mow or stack in the best possible condition so that it will not become moldy nor too dusty.

Medium red clover is the most commonly used. Most of the other varieties of clover, such as mammoth or sweet, are usually coarse and a considerable quantity is wasted. In feeding clover, about the same precautions should be followed as with alfalfa; that is, feed a limited amount and have the hay as bright and clean as possible. A mixture of clover and timothy hay is a very desirable roughage for horses.

Soybean Hay and Soybean Straw

During recent years more interest has been shown in the production of soybeans, and the acreage is increasing in Iowa. The use of soybean hay and straw as a horse feed is also receiving more attention from farmers. Soybean hay generally contains more protein and total digestible nutrients than alfalfa or clover and can be used for feeding horses of all ages where corn or corn and oats are used as concentrates.

The stems are rather coarse and horses will not eat all of them, but the finer, more nutritious portions are readily consumed. Soybean hay is frequently used to fatten horses and mules for market, because the animals make satisfactory gains and finish with a smooth, glossy coat of hair.

Prairie Hay

This is another carbonaceous roughage that is widely used as horse feed. It is not generally regarded as having as high feeding quality as timothy, and it usually sells for much less on the markets. Like timothy, prairie hay is not high in digestible crude protein and must be supplemented with nitrogenous feeds. Prairie hay can be used for all classes of horses with safety, but is not an effective roughage for colts, brood mares and stallions unless fed with either a protein-rich hay or concentrates. In Iowa it may be used in place of timothy, tho it is not so efficient.

TEMPORARY ROUGHAGES

Oat Hay, Barley Hay, Etc

These crops can be used as temporary hay crops with very good results. In case the regular hay crop winter kills, either

oats or barley can be grown and used for horses. The grain should be sown at the usual or a trifle heavier rate per acre and cut after it has headed out but before the grain is ripe, usually in the milk stage.

These hays are palatable and can be used for horses of any age. Horses may not consume the entire stalk, but what is left over can be used for bedding. If fed with corn, some protein should be added.

Soybean straw is very useful for wintering horses. The straw contains more than twice as much digestible crude protein as oat straw and is a valuable roughage when horses are running in stalk fields. Some advocate the planting of soybeans in the corn, and after the corn is picked pasturing the fields. The combination makes a very desirable and cheap ration for winter. At present more soybean straw than hay is available for feeding.

Oat, Barley and Wheat Straw

Straw from small grains is found on nearly every Iowa farm. The principal use made of straw is for bedding, but some of it can be used for wintering horses. Oat straw is regarded as the most valuable because of a somewhat higher nutritive content and is more palatable, but any straw of good quality can be fed.

Under no conditions, however, should straw be used as the sole winter ration because of the low protein and mineral content. At the South Dakota Station* it was found that horses wintered on oat straw were permanently injured because of being fed this feed as the sole ration during the winter. The horses were later fed a more nearly balanced ration, but the injury was not completely corrected.

Straw of all kinds is too bulky and lacking in nutrients to feed to work horses.

Straw can be used as a portion of the ration, but should always be supplemented with feeds rich in protein and minerals. It is often used as a part of the roughage ration when alfalfa or clover is fed. As has been stated previously, alfalfa or clover should be limited to 1 pound per day for each 100 pounds of live weight, but it is often advisable to feed a little more roughage and straw can be used.

Corn Fodder and Corn Stover

Fodder contains the grain while stover has the grain removed and, therefore, does not have as high feeding value as fodder. These are commonly used for idle horses but are not so well suited for work horses. These roughages are low in protein and should be fed with other feeds that will correct the deficiency.

*S. Dak. Bulletin 212.

Fodder and stover are difficult to feed in the barn because of their bulky nature. Leaves and the top portion of the stalk may be eaten, but the larger coarser portion is usually refused and must be removed from the mangers which makes extra work. When fed out in the fields the refused portions can later be raked up and used as fertilizer or burned if too bulky to plow under.

Fodders and stover when carelessly handled, become moldy, partially spoiled and unpalatable to horses.

Bright, clean fodder is usually most economically fed to work horses if it is cut or shredded. More will be consumed and what is rejected can be used for bedding. If the shredded fodder is dusty, it is a good practice to sprinkle it before feeding.

Corn Silage

Silage should not be considered as one of the principal roughages for horses, but it can be used if fed with care. Its use is mainly as a succulent and an appetizer to be fed in limited quantities as a supplement to the regular ration. When used, this feed should be introduced gradually into the ration and always with a dry roughage. The amount fed should not exceed 10 to 12 pounds daily per animal. It is a very dangerous practice to feed moldy or frozen silage. Cases have been reported where horses have died from being fed moldy or frozen silage and also from silage picked up around the feed bunks in the cattle yards, where it has been exposed to the air for some time and started to mold. Some farmers, however, feed corn silage to horses with very satisfactory results by being careful.

There are three precautions to follow when feeding corn silage to horses.

1. Use silage made from fairly mature corn.
2. Never feed moldy or frozen silage.
3. Limit the amount to 10 or 12 pounds daily and always feed with a dry roughage.

SALT

Salt is needed by horses of all ages. The sodium and chlorine which make up salt are necessary for the proper digestion of the ration. Salt may be fed free-choice, given at regular intervals, or fed with the grain. The first method is preferred since not all horses consume the same amount of salt and it is difficult for the feeder to know exactly how much is required. As a rule, horses will eat from $\frac{1}{2}$ to $1\frac{1}{2}$ ounces per day, depending upon their size, age, work performed, nature of feed and character of the soil on which the feeds are produced or on which the horses are kept.

Salt is also very beneficial because it encourages copious water

consumption and thereby aids in digestion. Where goiters frequently occur it is a good practice to feed iodized salt, especially to brood mares, stallions and colts. Iodized salt can be purchased on the market or the iodine can be added to the salt if care is taken to see that the salt and iodine are carefully and thoroly mixed. The usual amount of potassium iodide to add is .05 pound with 100 pounds of barrel salt. The home mixing of iodine with salt is much cheaper than purchasing iodized salt.

Iodized salt should be kept in covered containers as it is thought that some of the iodine evaporates when kept in ordinary sacks or open bins.

MINERALS

Much has been written during the past few years about the use of mineral mixtures for other classes of stock. Rapidly growing animals apparently require more minerals than those which grow more slowly. Some of our common feeds are lacking in mineral matter and if these are fed the ration should be supplemented. Calcium and phosphorous are two of the most important minerals that are lacking in common Iowa feeds, but can be easily and cheaply supplied. Ground limestone and spent bone black will take care of the calcium and phosphorus deficiency. A simple mineral mixture similar to the mixture used by the Animal Husbandry Section for hogs should prove satisfactory to add to the ration of any horse receiving the standard Corn Belt ration of oats, corn and hay. Using a variety of feeds lessens the necessity of feeding a complicated mineral mixture.

The following mixture, a simple, harmless combination that adds most of the minerals needed to improve the common rations used, has been fed to colts and brood mares at Iowa State College:

Iodized salt 20 pounds; finely ground limestone 40 pounds; spent bone black or bone meal 35 pounds; commercial iron oxide 3 pounds; sulfur 2 pounds; total 100 pounds.

The amount horses will consume depends upon the character of the feed and the age of the horses. Some horses require very little while others will eat as much as 1 ounce daily. If the mineral mixture has a decided odor it is best to mix it with the grain. Seldom will horses refuse to eat minerals when fed in this manner. If the mixture is practically odorless, it can be fed separately in a small box or even in the grain box. Horses are very particular about eating anything that has a strong odor. That is why spent bone black is suggested in place of bone meal.

MINERALS FOR WORK HORSES

In an attempt to find out what effects minerals have on work

horses, four teams (two horses and two mules) were placed on experiment. The ration fed consisted of oats 75 percent, yellow-corn 25 percent by weight and timothy hay. One horse or mule in each team was fed minerals in addition to the grain.

The minerals were mixed in the following proportions: Spent bone black 50 pounds, finely ground limestone 47 pounds and iron oxide (commercial) 3 pounds. Salt was fed ad libitum in separate boxes.

The teams were used for general farm work, including considerable hauling of feeds from town two miles away. They were all housed in the same barn in large, well-ventilated, single stalls. All were watered before and after each feed on work days.

The trial was divided into two periods. The first one covered 121 days and the second, 128 days. The mineral part of the ration was reversed during the second period. All animals were placed on a 12-day preliminary feeding period before the beginning of each period.

The horses or mules were all over 5 years of age when the experiment was begun, so it was felt that they were fully matured.

Table IV shows the average initial and final weights of each animal, the loss in weight per head and the amount of feed consumed.

During the first period which began in June, all animals lost weight. The four that were fed minerals lost 51.35 pounds per head, while those not receiving minerals lost 67.71 pounds. The feed consumption was slightly less for those not receiving minerals. One mule being fed minerals lost 81.17 pounds, while one in the other group lost 106.25 pounds. No particular reason could be given for the large losses of the two mules. They were not worked harder than the others, and they were fed practically as much grain as they would eat.

Just before the end of the first period, Molly refused to eat minerals. The allowance was reduced, but she still refused them and also some of her grain. When all the minerals were withheld she ate all of her grain, but refused again when a small amount of minerals was added. She apparently developed a dislike for the minerals and would leave grain rather than eat even a small amount.

When the rations were reversed the mineral-fed group again made a better showing than the others. They gained more weight on less feed. The two mules that lost weight heavily in the first period continued to lose in the second period. All others gained in weight, with a slight advantage in favor of the mineral-fed group.

TABLE IV. EFFECT OF MINERALS ON WORK HORSES

First Period—June 19 to Oct. 17, 1922—121 Days						
	Jim May Bess Molly	King Peggy Daisy Kate				
Initial weight (average) -----	1,529.68 lbs.	1,594.37 lbs.				
Final weight (average) -----	1,478.33 lbs.	1,526.66 lbs.				
Loss in weight per horse -----	-51.35 lbs.	-67.71 lbs.				
Average daily feed:						
Grain (Corn 25 percent, Oats 75 percent) -----	13.24 lbs.	12.58 lbs.				
Minerals -----	.0353 lbs.					
Timothy -----	19.54 lbs.	18.82 lbs.				
Second Period—Oct. 20, 1922, to March 6, 1923—128 Days						
	Jim May Bess Molly	King Peggy Daisy Kate				
Initial weight -----	1,478.33 lbs.	1,526.66 lbs.				
Final weight -----	1,507.49 lbs.	1,556.75 lbs.				
Gain in weight -----	+29.16 lbs.	+32.09 lbs.				
Average daily feed:						
Grain (Corn 25 percent, Oats 75 percent) -----	12.53 lbs.	12.01 lbs.				
Minerals -----		.0335 lbs.				
Timothy -----	19.29 lbs.	18.17 lbs.				
First Period—Individual Animals						
	Initial weight	Final weight	Loss or gain	Average daily feed		
				Grain	Hay	Minerals
Jim -----	1,725.00	1,603.33	-31.67	15.77	20.59	.037
May -----	1,456.25	1,418.33	-37.92	17.10	20.95	.037
Bess -----	1,552.50	1,463.33	-89.17	9.11	18.00	.037
Molly -----	1,385.00	1,338.33	-46.66	9.43	18.61	.032
King -----	1,830.00	1,755.00	-75.00	15.77	19.84	-----
Peggy -----	1,546.25	1,541.66	-4.59	16.31	18.83	-----
Daisy -----	1,541.25	1,435.00	-106.25	8.81	18.00	-----
Kate -----	1,460.00	1,375.00	-85.00	9.43	18.62	-----
Second Period—Individual Animals						
Jim -----	1,603.33	1,730.00	+26.67	16.17	20.30	-----
May -----	1,418.33	1,478.33	+60.00	17.15	21.66	-----
Bess -----	1,463.33	1,438.33	-25.00	9.00	18.35	-----
Molly -----	1,338.33	1,383.33	+45.00	7.79	16.68	-----
King -----	1,755.00	1,825.00	+70.00	16.17	20.00	.038
Peggy -----	1,541.66	1,555.00	+13.34	15.26	18.36	.029
Daisy -----	1,435.00	1,410.00	-25.00	8.50	18.43	.035
Kate -----	1,375.00	1,445.00	+70.00	8.03	15.89	.032

From the data obtained it would seem that there are some advantages in feeding minerals to mature horses and mules at work.

CONDIMENTAL STOCK FEEDS AND STOCK TONICS

Thousands of dollars are spent yearly on stock foods and tonics that have very little value and seldom, if ever, are worth as much as is asked for them. The best "tonic" for a horse is a well balanced ration of nutritious feeds fed according to the needs of the individual horse.

WATER

This is one of the most essential things in the ration of a horse and yet its functions are often overlooked. Water aids in digestion, carries off waste products from the body, flushes out the system and cools the animal.

It makes very little difference whether a horse is watered before, after or during a meal. The main thing is to adopt a definite plan of watering and then stick religiously to it. It is seldom that a horse will drink too much water under normal conditions. If the horses are too hot, or if water has been withheld from them for a long time it is not advisable to allow them to drink all they want, but if they have been handled carefully, they should be allowed to satisfy their thirsts.

FEEDING WORK HORSES

The methods of feeding work horses vary in different sections of the country. There is no one best way of feeding under all conditions. Available feeds, character of work to be performed and climatic conditions all have a bearing on how horses should be fed.

The amount of feed required for work horses depends upon the nature of the work, the size of the horses, their individuality and the rate of speed at which they work. Horses require much more feed when they work at a trot than when they are used at a walk. The feed eaten by horses is used to maintain and repair the body tissues and for productive work. Maintenance and repair must be taken care of first and the energy of the feed remaining can be used for work.

The ration for work horses must consist of a fairly large amount of concentrated feeds that are quite easily digested. A variety of feeds may be used, but the most popular are grains or concentrates that are easily digested, nutritious, palatable and cheap in price.

When the work is extremely heavy, it is necessary that the concentrates be heavily fed and that the roughage portion of the ration be limited. As the work becomes lighter the grain can be decreased and more hay added. Horses doing light work

can usually get along on from one-third to one-half as much grain as when they are working hard.

SUMMER FEEDING OF WORK HORSES

The ration for work horses for summer feeding can be somewhat different from the winter ration. It is a good practice to feed less heating feeds, or at least smaller amounts of the concentrates with a higher carbohydrate and fat content. Some farmers feed about 75 percent corn in the winter and then reduce the corn to 25 or 50 percent in summer.

From about the middle of May until cold weather in the fall, it is good practice to turn the horses on pasture at night. When the day's work is done, give the horses their regular feed and then turn them out for the night. After having eaten their regular evening feed they are not especially hungry and while they eat some grass, they will not consume enough to harm them.

The grass is cooling and laxative and keeps the horse's digestive system in good condition. The horses also have an opportunity to rest better out in the cool night air. A horse in a hot, stuffy barn cannot rest properly. Another advantage is that the damp grass helps to keep their feet from drying out. Labor requirements are also reduced by having the horses out during the night, and it has been found that they will get along with less feed than when kept in the barn.

When the horses are brought in in the morning they should be fed their regular grain ration, but usually very little hay is needed. In fact, if the pasture is good and horses eat a good deal of grass at night they may be better off with no hay at all in the morning. Where farmers have made a practice of turning horses out at night, they are so well pleased with the results that they do not want to go back to the old way of keeping horses in hot, stuffy barns.

SUGGESTED RATIONS FOR WORK HORSES

Oats, 3 parts
Corn, 2 parts
Clover and timothy hay

Oats, 2 parts
Barley, 2 parts
Corn, 2 parts
Mixed hay

Oats, 2 parts
Corn, 3 parts
Alfalfa hay, 1 lb. for each 100 lbs. of live weight

A bran mash made from 2 quarts of bran mixed with enough water to make a gruel should be fed in place of the regular grain ration on Saturday nights. On Sundays or other workless days the grain should be reduced to one-half, or even one-third, of the regular amount. In the summer, if the horses are on pasture, they may not need any grain. If they seem contented and satisfied it may be just as well to leave them on

pasture and not feed them any grain. On the other hand, one grain feed on workless days may keep them from consuming too much grass.

FEEDING IDLE HORSES

Mature, idle horses can be fed much cheaper than work horses. If horses are idle in the summer they should be turned on pasture. With average pasture conditions in Iowa, idle horses fatten readily on grass.

The most economical way to winter idle horses is to turn them in the stalk fields. This system utilizes considerable non-salable roughage, saves labor in handling horses and hauling manure, reduces housing costs, and keeps them in good, healthy condition, providing, of course, that the feed is plentiful. Cornstalks and straw are not adequate to winter horses in good condition. If fed on these roughages, by spring the horses are very thin and must be conditioned before they are in shape for spring work.

The addition of a little legume hay makes a great difference in the way horses will go thru the winter. Alfalfa, clover, a limited amount of sweet clover or soybean hay are valuable supplements to stalks and straw. The legume hays add protein and minerals and make the ration more nearly balanced. Stalks and straw are very deficient in both minerals and protein and horses seldom do very well when these nutrients are lacking in the ration. Under most conditions the addition of 8 or 10 pounds of legume hay will keep them in first class condition.

GENERAL RULES FOR REGULATING THE AMOUNTS OF FEEDS TO BE FED HORSES WHEN IDLE AND AT WORK ARE:

Idle horses—principally roughage, cornstalks, fodder or some other cheap roughage, with 8 to 12 pounds of alfalfa, clover, soybean hay or timothy per day.

Light work— $\frac{1}{3}$ to $\frac{3}{4}$ pound of grain and $1\frac{1}{4}$ to $1\frac{1}{2}$ pounds of hay for each 100 pounds of live weight.

Medium work— $\frac{3}{4}$ to 1 pound of grain and 1 to $1\frac{1}{2}$ pounds of hay for each 100 pounds of live weight.

Heavy work—1 to $1\frac{1}{4}$ pounds of grain and 1 pound of hay for each 100 pounds of live weight.

No hard and fast rule can be applied to all horses. The requirements of horses of the same weight, type and breed differ greatly. The above suggestions are given as general guides which can be used for average horses at various kinds of work.

It should be remembered that the kind of hay fed determines the amount of grain to feed and vice versa. If a good quality legume hay is fed to horses receiving considerable corn, less feed is needed than if the same horses are fed timothy.

How to divide best the daily ration is not thoroly understood by many feeders. Many feel that horses must be allowed to

gorge themselves on hay at each feeding time. Consequently, the hay too liberally fed is given in three equal feeds and as a result work animals fed this way are handicapped until they can get rid of some of the surplus. A simple rule to follow is to divide the three feeds about as follows:

Morning feed— $\frac{3}{8}$ of the grain and $\frac{1}{4}$ the daily allowance of hay

Noon feed— $\frac{3}{8}$ of the grain and $\frac{1}{4}$ of the hay

Night feed— $\frac{2}{8}$ of the grain and $\frac{1}{2}$ the hay

It will be noted that most of the hay is fed at night when the horses have ample time to digest roughage, and more grain is fed during the day when more concentrated feeds must be more readily available. Over-feeding of roughage is one of the most common mistakes made in horse feeding and it is a very wasteful practice. Horses at work are much better off if the hay is limited.

If horses are turned on pasture very little hay is needed in the morning. In fact, if the pasture is growthy probably all they need in the morning is grain.

CONDITIONING HORSES FOR SPRING WORK

Horses that are wintered out are healthy and in good physical condition, but are usually thin and have very long hair. Tho they may be fairly fat, they will have long hair. Some extra feed is needed before they are ready for work. Horses that are conditioned are able to convert their strength and energy into full power each day and can even handle an overload during the peak of heavy work. Thin horses cannot do this because they haven't strength enough and are often too poor to even work efficiently.

The careful farmer, who is looking ahead, makes a special effort to have his horses gaining in weight for several weeks before the actual field work begins.

The ration should be changed to include some concentrates. The change from rough, coarse feeds to some grain should be gradual.

If the horses can be kept in the barn at night, it is easy to increase their feed to get them in condition for spring work. Some farmers, however, do not care to take their horses out of the stalks until the weather breaks in the spring. This is often too late to start the conditioning process, but horses can be fed grain while still running out. A few ears of corn can be fed each day, which will soon improve their condition, or bunks can be used in which oats, bran, barley, linseed meal or other concentrates may be fed. From the standpoint of labor and housing costs it is best to leave the horses out as long as possible, but they would probably fatten faster and shed their long hair if kept in the barn at night. A yard with an open shed

for shelter is also a very suitable place to condition horses for spring work. Local conditions probably will determine how horses are handled in the spring, and it may not be of great consequence whether they are stabled or left in the fields, but it is very important that they should have extra feed and gain in condition before they start working.

Get Rid of the Winter Hair

Well fed horses usually shed early, or at least they start as soon as warm weather comes, while thin horses often fail to shed until well along in the spring. Long-haired horses cannot work as efficiently and are more susceptible to disease. They sweat profusely while working, which has a tendency to weaken them, and if they are allowed to stand when wet with sweat they often take cold.

Any normal horse will shed if well fed and gaining in condition. Feeds that are well suited to feeding thin horses are oats, corn, barley, bran, linseed meal, alfalfa and clover. Bran and linseed meal are especially valuable and need only to be fed in small quantities.

Clipping

Clipping to get rid of long hair in the spring is sometimes advocated and may be advantageous in some special cases, but not as a general practice. It is generally thought that the hair grows coarser after horses have once been clipped. Sometimes only the legs are clipped, but this is not a good practice with draft horses. The feather on the legs serves as a protection to the legs if kept clean. Clipped legs do not look right until the feather has grown to full length.

If horses are clipped the manes and foretops should not be removed. It takes a long time for them to grow out and not look shaggy. If there is any chance of selling horses to be handled by a dealer or to go to a central market they should never have any hair clipped from their legs, manes or foretops. Such animals sell as second-hand horses on the market.

Some farmers follow the practice of clipping the shoulders of long-haired horses and mules just where the collar fits on. This seems to help prevent sore shoulders because it keeps hair from matting on the collar, which sometimes irritates the skin and starts a collar sore.

If clipping is practiced it should be done before the new hair is long enough to be cut by the clippers, or the new coat will always have a rough appearance.

Clipping does not seem to affect a fine-coated, light horse as much as a draft horse. It is usually necessary to blanket horses for a few weeks after clipping, especially if it is done early in the spring.

Care of the Teeth

Horses should have their teeth examined at least once or twice a year by a competent veterinarian. Especially is this necessary if horses fail to respond to grain feeding in the spring. If considerable whole grain passes thru a horse, it is also a fairly good sign that the teeth are in poor condition. Slobbering is often caused by a sharp tooth gouging the cheek or tongue. In other cases a tooth often grows longer than the others, which interferes with the proper mastication of feeds.

Many of the teeth troubles might be corrected by a farmer if he has the necessary equipment, but the safest way is to call a veterinarian, who understands all abnormalities and can easily correct them.

Care of the Shoulders

When horses are started in work, special care should be taken to see that their shoulders do not become sore. Nothing reduces the efficiency of horses more than sore shoulders and necks, which frequently occur soon after the horses are put in harness. A little extra care at the beginning usually prevents trouble later on. Before starting work it is a good practice to wash the shoulders and neck with soap and water to thoroly clean out the dirt. Tar or any other good cleansing soap will do.

One of the best preventive measures is to wash the shoulders and neck once or twice daily with a salt water solution. The brine cleans the shoulders and makes the skin tough. The shoulders are usually bathed at noon and night. In most cases, however, once a day is all that is needed and this should be done at the end of the day's work.

Air slaked lime dusted on the shoulders at night also aids in preventing soreness. If air slaked lime is used, care should be taken to see that all the lime is brushed out before the collar is put on.

If the shoulders are galled at the end of a day's work, it might be well to rest the horses for a day or two rather than to continue the work and break the skin. Once the shoulders become toughened horses usually go thru the summer without further trouble. Neglect the first week or two often means that horses will have to be worked lightly or left idle until their shoulders are healed up.

FITTING COLLARS

Properly fitting collars are also helpful in preventing sore necks and shoulders. Each horse should have its own collar, which should be fitted with great care. Several collars of different shapes have been designed for horses with different shaped shoulders and necks. For example, horses with straight shoulders and wide necks may work well in a half or full

sweeney collar, while horses with well shaped, sloping shoulders can wear a regular or full face collar.

Many have an incorrect idea of what a proper fitting collar is. The pulling contests have demonstrated clearly that many horses are fitted with collars that are too short and which choke the horses when they pull. Horses that have once been choked when pulling with a short collar are not likely to exert their maximum effort again unless the collars are changed. In contests horses have pulled what appeared to be their maximum load, but by changing collars they have pulled several hundred pounds more and have done it much easier than the light load with short collars.

When horses are standing the collars should be two and one-half to three inches longer than the depth of the horse's neck. For light work a collar that will allow the hand to pass between the collar and neck may be long enough, but if horses are required to pull heavy loads collars of this length are too short.

The width of the collar is just as important as the length, if not more so. A wide collar is often responsible for galling shoulders because it slips from side to side. The collar should fit fairly snugly along the side of the neck. Just enough room is needed to push the fingers between the neck and collar. Some adjustments can be made with the hames. If the collar is too wide it can often be made to fit well by changing the hames and buckling them tight. A few minutes adjusting collar and hames may save a good deal of trouble later on in caring for sore shoulders.

The condition of horses has a lot to do with the way collars fit. Collars that are right in size when horses are fat probably will be too large when the horses are worked down. This should be watched and adjustments made.

A common practice is to use collar pads to make the collars fit better. The use of pads should be discouraged as much as possible because they are very hot and often become hard and ridgy. The lighter weight pads with an oil cloth front are preferred to the heavy, thick, cloth pads. When pads are used they should be cleaned frequently as dirt and hair often collect on them, forming very rough spots.

Collars should also be cleaned every few days. Scrape the hair and dirt off with a knife or wash them with soap and water. Usually the farmer who gets the most out of his horses is one who watches the collars and shoulders carefully and keeps them in good condition.

CARE OF THE FEET.

Horses' feet need constant care to keep them in good condition. Too often the feet are allowed to grow abnormally long,

which causes the weight to be improperly distributed on the foot. Untrimmed feet usually break off, leaving the foot unbalanced. This causes a strain on the tendons, which sometimes results in unsoundness and may interfere with a horse's action.

The feet and legs should be viewed from the front and side to determine the correct shape before the trimming is done.

By use of a hoof knife, overgrowth of the frog and sole should be pared off, removing the loose material and that which is cracked. The frog, however, should never be cut back too much or its protective function is reduced. The next step is to take hoof cutters and nip the hoof wall down to about the same level as the sole. Then take a rasp and smooth off the rough places. Make sure that the heel and toe are the right length to give the foot the correct shape. When the bottoms of the feet are finished, hold the feet in front of the horse and with the rasp round off the walls and smooth up the horny portion.

Feet that are regularly trimmed seldom have quarter cracks nor do they cause much trouble. The frequency of trimming depends upon how the horses are used, but usually a little shaping up can be done about every 60 days. Practically all horses that have been running out during the winter need their feet trimmed before being placed in harness.

Foals seldom need their feet trimmed before they are 3 months old. A new-born foal has a soft, horny material on the bottom of its feet which usually sluffs off in a few days. In a short time it will be noted that the feet are growing larger near the coronary band. The new growth soon takes the place of the old and the feet have more spread to the heel, more slope to the walls and are rounder. If the feet are not wearing evenly at this age, a hoof knife or rasp can be used to level them up. In fact, much can be done to straighten crooked feet and sometimes incorrectly shaped pasterns and legs by trimming the colt's feet.

Neglect of the feet may mean a mature horse with poorly shaped feet or possibly an unsound individual. By all means see that the weight is properly distributed on the feet and that the toes and heels are not allowed to grow so long that they strain the tendons or make the pasterns too straight.

GROOMING

Daily grooming of work horses is essential to keep them in good condition. Horses that are running in the open field or on pasture do not require grooming, but horses that are highly fed and doing active work need grooming to keep them clean and

remove impurities secreted by the skin. Many horsemen believe that a daily grooming is as essential to keeping stabled horses in good condition as proper feeding.

Excretion of worn-out materials thru the skin goes on more fully in highly fed horses that are worked hard and thoroly groomed.

The healthy or unhealthy condition of the skin is very readily shown by the appearance of the hair. If the skin is unhealthy, the hair is harsh and dry. Careful daily grooming will remedy this condition by cleansing the skin of secreted material and allowing the glands to function unchecked.

The most useful piece of equipment to use in grooming horses is a good brush. The dandy or fiber brush is generally used first, followed by the bristle or body brush. Curry-combs are also useful in cleaning horses, but should be used carefully. The corrugated or reform comb is preferred by some, while others like the regular or arc comb. Curry-combs should be used just to loosen the dirt which can then be removed by means of the brush. Brushes should be kept clean by rubbing them over the curry-comb or the hand. Brushes cleaned on combs wear out quicker than if cleaned by hand. In brushing, the stroke of the brush should follow the natural direction of the hair. Sometimes to loosen sweat or dirt on the hair a few strokes against the hair will help, but brushes will not penetrate as deeply against the hair as with it.

Horses' legs should receive special attention and should be cleaned carefully. Curry-combs must be used cautiously on the legs, but brushes can be more vigorously used. The fetlocks and back of pasterns should be thoroly brushed so that the dirt will not cause a skin irritation, which may develop into scratches if neglected.

Horses shed their hair coats in the spring and fall. In the fall, longer hair grows as a protection against cold weather, while in the spring, the long hairs are replaced by shorter ones for warmer weather. Grooming assists in removing the loose hair and at the same time keeps the skin clean and healthy.

When grooming is neglected, horses often lose in condition and sometimes deteriorate in health. Ungroomed horses seem to be more susceptible to mange and parasites because the insects are not disturbed and breed more rapidly.

Short, glossy hair coats, which are desired by all horsemen, are the results of good grooming. Glossiness in the hair is due to the absence of dirt, increased secretion from the oil glands and partly to the mechanical action in polishing the hair.

Washing is not commonly practiced in caring for horses. Horses' coats are very thick and water will not easily penetrate the hair. Water seems to retard the action of the oil

glands and leaves the coat harsh and dry. The legs are frequently washed to remove mud or manure stains, but after washing they should be immediately dried by use of sawdust or cloths. After drying, the legs should be carefully brushed.

For grooming the mane, foretop and tail, a small wool card is very useful. The card will separate the hair, but will not cut off the long hair as will a curry-comb. If the mane and tail are too long and thick, they should be thinned out by using a pocket knife or pulling some of the extra hair out with the fingers. A little rosin on the fingers is helpful in pulling manes or tails. To thin out the tail with a pocket knife, run the blade thru the hair below the end of the tail bone and then with a downward stroke cut and pull until the tail is the desired thickness.

Never cut the mane or tail with scissors because they never look well when cut off squarely. Keep them looking as natural as possible.

A woolen cloth with a little oil on it is very useful for cleaning horses' heads and in removing the light dirt from the body which does not come off with the brush.

SELECTING BROOD MARES

In selecting brood mares, the breed is not so important, but the type is. There is no best breed for all conditions. One farmer may prefer one breed and his neighbor a different one, and both have equally good success with their horses.

Good brood mares should be sound, of good size, type and form. They should have big feet, well-set legs, with clean flat bone. They should possess a breedy appearance by being deep-ribbed, roomy, with a strong constitution and show style, femininity and refinement about their heads and necks. Big, coarse, sluggish, plain mares are seldom as good breeders as the medium-sized mares that possess quality, style, breediness and refinement. At times brood mares are compelled to perform several different functions. They may be working, suckling a colt and developing a foetus. These things all tax mares and they must possess capacity for feed, constitution, vigor and vitality in order to perform these tasks satisfactorily.

AGE TO BREED

As a general practice, farm mares should not be bred until they are 3 years old, and if it is necessary to work them hard, it might be best not to breed them until they are 4 years old. Some well developed, purebred mares are bred as 2-year-olds, but they are seldom worked while suckling their foals. On the other hand, it is not advisable to let mares get too old before they are bred or they may never raise colts.



Fig. 6. Farmers studying Percheron and Belgian brood mares.

Spring is the most natural time for mares to be bred, but they can be bred at any time of the year. Normal mares come in heat nine days after foaling and every 21 days thereafter. Occasionally mares that are suckling foals will not breed until after the colts are weaned. Such mares are usually bred every other year.

Mares should be bred to the best available stallion in the neighborhood. Farmers should not let the matter of a few dollars in service fees determine the sire to use. Good livestock has been developed and improved by breeding the "best to the best" and this is the rule that should be followed.

TIME OF FOALING

If one has a warm barn with a roomy box stall in it, there is no reason why mares should not be bred to foal in January or February. The advantages of early colts are that the mares foal when they are not needed for field work. Secondly, farm work is not so rushing that if additional time is needed in caring for the new born foals it can be given without interfering with field work. The third advantage is that the colts will have a good start and be eating grain and hay by the time the mothers are needed for spring work. Keeping the mares away from the foals for a half day when the colts are eating grain will not hinder their growth very much, if any.

May and June colts have some advantages, such as allowing the mares to foal in pasture, which is probably the cleanest place for foals to be dropped; and, secondly, the colts can be

started on grass which usually means that they will have a chance to start life under more favorable conditions of feed and weather than early colts.

March and April colts keep the mares out of harness at a time when they are badly needed for spring work.

Fall colt production is advocated by some farmers as the colts are foaled at a time when the mares are not needed for work. This makes it possible for the colts to be left with their mothers continuously until they are weaned. They can be weaned before spring work opens up and their mothers will be in good condition for the work season. Fall colts as a rule require more care than spring colts, but farmers are usually not so busy and a little extra labor is not so costly as it would be in the spring. It is also thought that fall colts gain faster when turned on grass soon after weaning.

PREPARATION FOR FOALING

If mares are to foal in the barn, about the same precautions as to sanitation should be followed as with sows. All litter and straw should be removed and then the floor and partitions should be thoroly disinfected. It might be well in case of a very dirty stall to wash the walls and sprinkle the floors with lye and water. Air slaked lime scattered over the floor is also very effective. After the stall is dried out a little, put in a liberal amount of clean, dry straw. Use every precaution to keep the stall clean and the newly born foal free of infection of any kind.

FEEDING BROOD MARES

It is important that mares be properly fed from the time they are bred. At breeding time they should be in good condition and from then on the feeds used should be suited to the condition of the mares. All feeds should be clean and bright, and care should be taken to avoid coarse, extremely bulky feeds, as well as dusty, moldy or spoiled feeds of all kinds. Use only feeds that are palatable, easily digested and nutritious. Such home-grown feeds as oats, barley, corn, roots, alfalfa, clover or mixed hay are especially useful in feeding brood mares. Wheat bran and linseed meal are valuable commercial feeds that can well be used in the feeding of mares.

Pregnant mares need a liberal allowance of protein and minerals, which are the bone and muscle building portions of the ration.

It may be advisable to feed a small quantity of the mineral mixture previously suggested. Oats, bran, oilmeal, alfalfa and clover all contain fairly large amounts of these important nutrients. Corn can be fed in small amounts if it seems advisable to fatten the mares. Bran mashes fed once a week are useful

in keeping the digestive system in good condition. A bran mash just before and after foaling will help regulate the bowels. In fact, the first concentrate that mares receive after foaling might well be a bran mash.

All changes in rations or methods of management should be gradual. Never pamper mares by overfeeding and insufficient exercise. Such mares usually produce weak foals that lack vitality and resistance to disease. On the other hand, foals from mares that are undernourished often lack vigor and size. In most cases of underfeeding, however, the mares suffer more than the colts. Liberal amounts of salt and water should always be allowed.

EXERCISE

Exercise is another important factor in the successful management of mares. Regular light work is the best form of exercise. Avoid heavy backing or overloading when the roads are wet and slippery. Carelessness in handling mares may cause abortion. As foaling time approaches, lighten the work, but it is not necessary to take mares out of harness, if they are being carefully handled, until a few days before they will foal.

If there is no work for mares to do, they should be out every day for exercise. In this section of the country it is usually customary to stable mares during the winter, but it is not absolutely necessary. A dry shed with a southern exposure may afford all the shelter well-fed brood mares need.

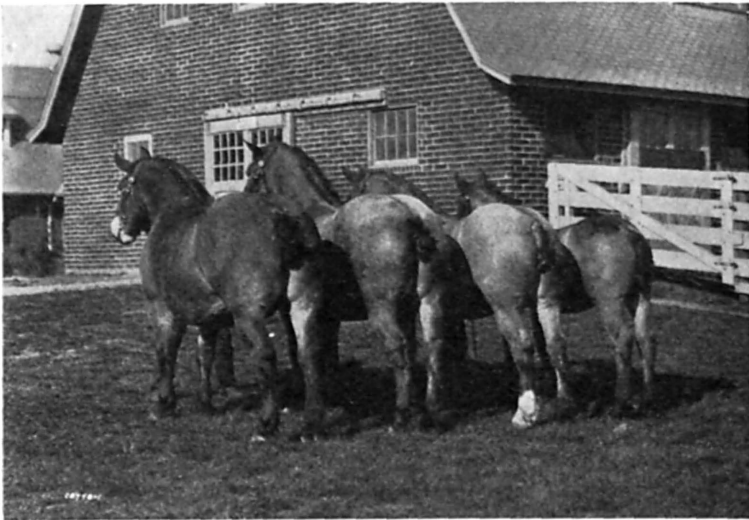


Fig. 7. A good Belgian brood mare with three of her colts.

Just before foaling the grain ration should be reduced. If the mares have been working, more precaution must be taken in the feeding and management because of the abrupt change and the necessary reduction of exercise for several days.

If possible, place the mares in the stalls in which they are going to foal several days before foaling time. Let them become familiar with their new surroundings. A box stall for large mares should be about 16 feet square. A 14 by 16 foot stall or one 14 feet square may be large enough for some mares, but the larger, roomier stalls are to be preferred.

SIGNS OF PARTURITION

The signs of parturition are a full udder with wax extending from the ends of the teats for about 12 hours, a loosening of the muscles of the hips and a little restlessness.

Be on hand at foaling time to assist in case of an abnormal presentation, but otherwise do not bother the mares. They like large, quiet, rather secluded stalls in which to foal. An attendant or other animals too nearby may worry them, and in their excitement they may injure the foals.

Foals must be delivered quickly or they will smother. In case of an abnormal presentation, call a veterinarian quickly. An inexperienced attendant may injure both the mare and colt.

The most common presentation for colts is front feet first with their head extending along and partially between their legs. Some colts, however, come with their hind feet first. Any other presentation is abnormal and a veterinarian should be secured as quickly as possible.

As soon as the colts are dropped, remove their heads from the envelope that usually covers them and clean the mouth and nostrils of all mucus. If the weather is cold, it may be advisable to dry the newly born foals with straw, sacks or cloths of any kind.

Normally the umbilical (navel) cord will break several inches from the body, but sometimes it is necessary to cut it. If it is necessary, use a pair of sterilized scissors and cut the cord about two inches from the body. The cord and navel should then be disinfected with iodine or some other equally effective disinfectant. This treatment should be repeated daily until the cord sluffs off and the navel is entirely healed. Every precaution should be taken to prevent infection getting into the system thru the navel. It is thought that joint ill or navel infection is caused by a germ which enters the body thru the navel. This ailment is responsible for a high percentage of the deaths of colts each year. The disease can be pretty well controlled by sanitation, since it frequently attacks colts that are kept in dirty stalls. Cases have been known where colts had



Fig. 8. Mares and colts on bluegrass pasture. This is an excellent way to raise strong, healthy colts.

joint ill when they were born, which probably means that the infection came from the mother.

Foals, if strong and vigorous, will soon be up trying to suckle. A little assistance from an attendant may be necessary to get them started sucking. It is advisable that new born foals get the first milk, colostrum, because of its purgative properties. The laxativeness of colostrum tends to start the bowel movements of the newly born foals and thus removes the fecal matter (meconium) lodged in the bowels. If the fecal matter is not voided within 12 to 18 hours, the foals should be given an injection of warm soap suds and in some cases a dose of 1 ounce of castor oil.

After foaling, withhold part of the feed from the mares for the first day, but allow them frequent drinks of warm water. The warm water is especially desirable if the weather is cold. The first feed of grain should be mostly bran, either dry or in the form of a mash. Increase the grain slowly, watching always not to feed too much grain, which in turn produces milk, until the colts are able to handle it. Mares fed too liberally on grain the first 10 days often cause their colts to scour because of too much milk.

Mares should not be worked for at least 10 days after the colts are born, but the mares and colts should have regular, daily exercise. If the weather is warm, turn them in a paddock or pasture. When work is resumed, it should not be too severe; in fact, it is a good plan to work them for half a day at first

and then gradually increase the time until they are working a full day.

The colts should be kept in the barn in comfortable box stalls while their mothers are working. They should be taught to eat grain just as early as possible. If they do not get too hungry, they will not fret very much when away from their mothers.

If the mares are warm when they come from the fields, they should not be put in with the foals until they have cooled off. The milk from warm mares may cause colic. It is a good plan to milk the heated mothers a little before turning them in with their colts.

During the period the colts are suckling, either feed them with their mothers or have separate boxes and feed them individually. The gains of the young colts are the cheapest so foals should always be fed liberally to obtain the greatest growth possible the first year.

The grains for colts need not be prepared to get them started to eat. Good, bright, clean oats and a little bran make a very good combination. Rolled oats are satisfactory, but they apparently are no more palatable to colts than the whole grain. If, however, barley is used, some preparation is necessary. The roughage can be good quality clover, alfalfa or timothy. In fact, any palatable feed not injurious to colts can be used.

FEEDING ORPHAN FOALS

The feeding of orphan foals often causes considerable trouble because farmers do not understand the differences in mares' and cows' milk. Mares' milk does not contain as much fat, but it does contain more sugar. To feed an orphan foal, secure milk from a fresh cow, preferably a low tester. To a pint of cow's milk add $\frac{1}{4}$ pint of lime water and a teaspoonful of sugar, which is enough for two feeds at first. This makes the mixture about the same composition as mares' milk. Warm this to 100° F. and put in a bottle with a rubber nipple on it. All containers and the nipple should be washed and carefully sterilized before using. At first feed the foals about every hour and usually a half pint of milk is enough to start with. As the colt grows older, the quantity of milk can be increased and also the time between feedings can be lengthened. Be very careful not to over-feed, especially during the first few weeks or scours may result.

Teach colts to drink from a bucket as soon as possible rather than to continue bottle feeding, which will eliminate cleaning and sterilizing the bottle and nipple. When colts drink from a pail, it is a good practice to put a little grain in the bottom of the bucket and when they are thru drinking the milk they will soon begin eating grain. After colts begin eating grain,

feed some at least three times a day. Avoid overfeeding of milk or the colts may become pot-bellied, a condition they seldom outgrow.

Put the orphans on grass as soon as possible, but also feed grain and hay, especially feeds that have a fairly high protein and mineral content.

WEANING COLTS

Colts can be weaned any time after 5 months of age, but whenever possible the colts should be left with their mothers for a longer period. If the mares are in good condition and not working too hard, they can easily feed their colts a month or two longer. Milk and grain are very good feeds for obtaining growth.

To wean the colts they should be separated from their mothers and never allowed together again until they have forgotten each other. Colts that are eating grain will not greatly miss the mother's milk at this age. When weaned they should be placed in a box stall or paddock where they cannot hurt themselves. Putting several colts together helps them to become reconciled to being away from their mothers.

If the mares are being fed grain, it should be reduced for a day or two before the colts are taken away. The udder should be watched carefully and milked out when necessary, but the milkings must not be too frequent nor too complete or the mares will not dry up.

FEEDING AND MANAGEMENT OF COLTS

After colts are weaned they should be fed a good growing ration, be given good care but not pampered. Oats, barley and corn are probably the safest grains to use, but if corn or barley is fed it should be supplemented with protein feeds such as bran, soybeans, linseed meal, gluten feed or any other protein-rich feed that is palatable to colts. The roughage should be well cured, clean and as free from dust and mold as it is possible to get. Alfalfa and clover are good growing feeds, being rich in proteins, fairly high in calcium and are very palatable to colts. These roughages should be fed in limited amounts since they are relatively high in protein, and somewhat expensive. Many breeders follow the practice of feeding alfalfa once a day and for the other feedings use timothy, mixed hay, prairie hay, sheaf oats or good quality corn fodder. The amount and kind of roughage to be fed depends somewhat upon the grains that are available. Salt and water should be kept before colts at all times or given at regular periods.

Satisfactory rations for colts are as follows: Oats 4 parts, corn 1 part, bran 1 part and clover or alfalfa hay supplemented

with timothy or some other cheaper roughages; or oats 3 parts, corn 3 parts, bran 1 part and linseed meal 1 part with good quality roughage.

The amount of grain to feed depends upon the age, size and condition of the colts. Seldom will colts need more than $\frac{3}{4}$ of a pound of grain for each 100 pounds of live weight.

Colts should be taught to lead when they are young. The older they get before being halter broken and taught to lead the more difficult it is to handle them.

Colts should be housed in either a barn or a good, dry, open shed. Their quarters should be clean, well ventilated, sanitary and roomy. Less labor is required to care for them when they are housed in an open shed, but some farms do not have suitable sheds and have good barns. It is satisfactory to run a number of colts together even tho there is some danger of them injuring each other.

Young horses should be given regular, daily exercise. In fact, they should be out every day except in cases of very severe storms. Under no conditions should colts be deprived of sunshine and fresh air.

During the late spring, summer and fall, colts should be turned on pasture. If the grass is fairly abundant no additional feed is needed, but if the pastures become too short it is advisable to feed a little grain or hay or both. Colts should not be



Fig. 9. Two-year-olds on pasture; the cheapest way to grow colts.

compelled to stay on scanty pastures and become thin when a little extra feed will keep them in good condition.

The second winter and summer the colts should be handled and fed about the same way as they were the first year. Slightly more grain may be needed, but in normal cases the amount is relatively small.

Club colts that are being fitted for fall shows should be kept a little fatter than the average colt. It is also well to keep the show colts in a dark barn during the heat of the day, especially is this advisable if the colts are dark colored because their hair sunburns or bleaches out and it is difficult to make them look attractive. It is advisable, however, to turn them on pasture during the night. The rations previously suggested are satisfactory for fitting show colts.

SELECTION OF STALLIONS

Stallions usually represent a large investment; therefore, they should be selected with extreme care. Soundness is important and should not be overlooked. Iowa laws prohibit stallions possessing certain unsoundnesses from standing for public service. When selecting stallions they should be carefully examined around the hoof heads, pasterns, hocks and eyes. Only a competent veterinarian should be consulted about the condition of the eyes. A superficial examination is not sufficient to show whether horses have had one or more attacks of periodic ophthalmia.

Size is another important factor to consider in selecting stallions. Many mares are too small and farmers must depend upon the stallions to increase the size of their horses. Draft stallions should weigh at least 2,000 pounds when mature and more weight is desirable if sufficient quality can also be obtained.

The head is very important since it shows much of the sex character. Stallions' heads are somewhat larger and bolder than a mare's with a distinct masculine appearance. The eye should be large, bright and prominent, showing brilliance, or as it is aptly termed, "fire." Their necks should be long and well crested with a clean throat-latch. Stallions should show style, vigor, character, boldness and masculinity in head and neck.

The bodies of stallions should be deep, wide and muscular. Their shoulders should be long and sloping, their chests deep and wide, showing a strong constitution and their ribs should be deep and well sprung. Their flanks should be deep, indicating feeding capacity, while their backs should be short, with a strong coupling, their croups long and level and their quarters deep and powerfully muscled.

The feet and legs deserve special consideration and too much emphasis cannot be placed on them. The feet should be large,

with wide heels and open hoof heads, the pasterns long and sloping (about 45°), and the cannon bones should be wide and flat; with well defined tendons. It is essential that stallions show more substance in bone than mares. Well-set hocks that are deep, clean and strongly supported are important.

At a walk stallions should move with a long, straight, free stride, while at a trot, their action should be bold and powerful with free flexion of the hocks and good height in knee action. In every way stallions should show strength, power, durability, substance, quality, style and character.

Testing the wind of stallions is an essential procedure before buying. They should be vigorously exercised, then quickly stopped and their breathing observed. An inexperienced man should seek the services of a veterinarian in making an examination of the eyes, for general unsoundnesses and testing of the wind.

AGE TO BREED

Well-grown 2-year-old stallions can be used to breed 10 to 15 mares a season. Some horsemen recommend not more than one mare a week, while others prefer to breed several mares a week and finish the breeding season as quickly as possible. They maintain that the young stallions will feed better if the season is not too long. Older stallions can breed proportionately more mares—3-year-old stallions from 35 to 50 mares; 4-year-old stallions from 50 to 75 mares; and aged stallions from 75 mares up.

The number of mares stallions can breed, however, depends upon their care, feed and exercise.

FEEDING STALLIONS

Stallions in service need a liberal allowance of nutritious, well balanced feeds, which contain a relatively high percentage of proteins and minerals. Oats, bran and linseed meal are admirably suited for feeding stallions, while corn, barley and a little wheat can be used, but are usually too fattening to feed in large amounts. A small amount of corn or barley with oats and bran is satisfactory, especially if linseed meal, alfalfa or clover hay is fed.

Alfalfa is the most palatable roughage obtainable, but it must not be fed in too great amounts. Clover is also good, but it is usually dustier than alfalfa, while timothy is the safest of all roughages, but is not so nutritious. A satisfactory roughage combination is alfalfa or clover one-half and timothy one-half.

The amount to feed depends upon the age, size, exercise and the number of mares being bred.

A general rule is to allow stallions from $\frac{3}{4}$ to 1 pound of

grain and 1 to 1¼ pounds of hay for each 100 pounds of weight during the breeding season. When not in service, they should be fed less grain and more hay.

Suggested rations for stallions in service are:

Oats, 8 parts
Bran, 2 parts
Timothy and clover hay

Oats, 8 parts
Bran, 2 parts
Alfalfa, 8 parts
Timothy, 8 parts

Oats, 6 parts
Barley, 2 parts
Bran, 1 part
Linseed meal, 1 part
Timothy

Oats, 5 parts
Bran, 2 parts
Corn, 3 parts
Alfalfa or clover, 5 parts
Timothy, 5 parts

Any of the foregoing rations could be varied to suit particular conditions, but it is necessary to furnish considerable variety and a liberal amount of digestible crude protein and ash.

Roots, especially carrots, are valuable because of their succulent nature and if a pasture is not available, cut grass, alfalfa or clover make good supplemental feeds.

Stallions should be kept in good condition but not overly fat. Excessively fat stallions are seldom so sure as breeders as those that have been conditioned by the use of well balanced rations.

Exercise is very necessary to the well-being of stallions of all ages. The exercise should be regular rather than at intermittent periods. A paddock connected with the barn, where stallions can be turned daily, is probably the most convenient and satisfactory place to exercise them.

Paddock fences for stallions should be strong and at least 7 feet high. It is a good plan to make the fence so that horses can look out and see what is going on. Solid board fences are more expensive and stallions do not exercise so well in a yard thus enclosed. Figure 10 shows the types of paddock fences successfully used at Iowa State College farm.

If yards are not available, stallions can be exercised by leading them at least 1 to 8 miles daily. Exercising stallions this way is a burdensome task and not so satisfactory as turning them in a yard and letting them run at will.

WORKING STALLIONS

Some advocate that stallions be worked and this has a good deal of merit. They can be broken to work at 2 or 3 years of age and if carefully handled can do as much work as the average horse. During the breeding season, however, a half day's work is probably as much exercise as stallions should have, but during the remainder of the year they can earn their keep by working full time.

Stallions should be worked with a well broken, easily handled

mare. It is advisable to use a "jockey stick" at first to prevent the stallion from getting his head too near the other horse. Usually after they have been worked for a short time they are easily handled and perform their work as satisfactorily as mares or geldings.

GENERAL CONSIDERATIONS IN MANAGING STALLIONS

Owners of stallions should have a certain place conveniently arranged where all the breeding is done. It is not a good practice to allow stallions to serve mares at different places around the farm because stallions handled in this manner are more difficult to manage when other horses are around.

Every precaution should be taken in handling public service stallions not to introduce disease to other horses on the farm. Outside mares should all be inspected and if they are diseased in any way they should not be bred until the trouble has been cleaned up. After stallions have served mares they should be immediately washed up with some good disinfectant.

It is advisable to have stallions out in the sunshine a few hours each day, which exposure insures sufficient assimilation of the much needed vitamin D. Sunshine, fresh air, exercise and good feed contribute materially to their ability to successfully settle mares in foal.

Their feet should be watched carefully and kept in good condition. If stallions are used on the road it will be necessary to keep them shod; otherwise, they are better off without shoes.

Stallions that are kept in dark, dirty box stalls without regular exercise are likely to develop vices that make them difficult to handle.



Fig. 10. A satisfactory paddock fence for stallions, mares or colts.



Fig. 11. An excellent type of 3-year-old gelding; reserve champion, 1930 International Livestock Exposition; bred, fed and exhibited by Iowa State College. Too young to sell on the open market; this gelding was sold to the Union Stock Yards for use in a six-horse show team.

MARKETING HORSES

Farmers who have horses for sale often make the mistake of not fitting them before sending them to market. They do not seem to realize that horses bring more money if fattened and fitted before being sold. Many horses are offered for sale right out of the cornfields when they are very thin, and have long, shaggy hair coats. Horses must be fattened and conditioned to sell well. Dealers who buy thin horses from farmers pay just as little as they can for them because they realize that they will have to feed these horses for quite a time before they will sell to good advantage on the market.

A merchant offering goods for sale fixes them up in the most attractive manner possible and can secure the highest price. The same principle applies to selling horses. The most attractive ones sell most readily and for the highest price.

The market for horses is seasonal. Southern chunks, which weigh from 800 to 1,250 pounds, sell most readily in December, January, February and March, while farm chunks, which are larger and of better quality, begin to sell in January and are in demand until early summer. The large, good quality draft horses sell most readily in the late winter, spring and early summer, altho there is a limited demand during the re-

mainder of the year. The big, plain, blemished horses, which sell as loggers, find their best market in the fall and early winter. The wagon horse, which weighs from 1,100 up to 1,500 pounds and is used mostly by dairy companies, will sell most any time of the year. If farmers would fit their horses at the time of the year when the demand is greatest, they could receive more money for them.

The factors which determine how well horses sell on the markets are: (1) Type, (2) condition, (3) weight, (4) age, (5) soundness, (6) sex, (7) conformation, (8) color, (9) training, (10) disposition, (11) style and (12) action.

FEEDING FOR MARKET

It is practically impossible to get horses too fat to sell well on the markets. In fact, condition is one of the most important factors, because a fat horse is heavier, more attractive in appearance, shorter haired and healthier when shipped. Shippers claim that fat horses do not contract disease so readily as thin ones. Thin horses, which are usually long haired, sweat profusely in the cars, chill when taken out and seem more susceptible to shipping fever. The best guarantee that horses will arrive safely at the markets is that they are fat and short haired when loaded.

When horses are placed in new surroundings and worked under new conditions they often lose weight. If they are thin to start with and still lose some of their weight, they may be cheap looking animals. At any rate, they are not attractive to buyers and the buyer fixes the price.

To fatten for market, stall feeding is the best. Select roomy, well ventilated stalls and tie the horses in, leaving them there until two or three days before shipping. Do all the feeding and watering in the stalls and do not exercise until the fattening period is over. It is true that they will "stock" or fill in the legs for a short time, but this condition will soon clear up and their legs will be clean as ever.

The feed for the first two weeks should be fairly light, but after that the ration can be increased to a full feed. In fact, in many cases it is well to feed four times daily to get the most rapid gains.

Any good fattening ration is satisfactory, but such feeds as corn, oats, barley, bran, oilmeal, alfalfa, clover or timothy are some of the best to use. It is well to feed palatable feeds and have considerable variety so as to induce horses to consume large amounts. Gains of 5 pounds daily are not uncommon with stall-fed draft horses.

Three or four days before the horses are to be shipped, the grain ration should be reduced at least one-half. The animals

should then be taken from the stall and given a little exercise. This should be repeated for several days, each time increasing the amount until the horses are finally shipped. If the grain is not reduced before exercising, the horses are apt to contract azoturia which may prove fatal.

PREPARATION FOR MARKET

Do Not Roach or Clip

Horses to sell best on the central markets must carry a full mane, foretop, tail and have a normal growth of hair on their legs. Roached horses or those that have hair clipped from their legs will sell on the market as "second hand" horses instead of fresh country horses. Buyers consider these horses as animals that may have been used in cities or on construction work and found wanting in some way and were sent back to the country for reconditioning. At any rate, dealers or market men will not pay as much for such horses, so farmers who expect to sell horses should not clip them in any way. The difference in price may be as great as \$50 per head, depending upon how much clipping has been done.

AGE TO SELL

The markets do not want immature horses. The best ages to sell are from 5 to 8 years. Three and four-year-olds never sell very high because they are shedding teeth and are not fully mature and buyers feel that horses of these ages cannot do as much hard work as those 5 years old or over.

In most cases these young horses can do their share of farm work and, barring accidents, are actually increasing in value. The older horses are the ones that depreciate in value so should be sold and the colts retained in their places. The practice of raising a few colts each year for replacement needs is a very good one.

BREAKING AND TRAINING

Horses are always hitched before they are finally settled for, when sold on the market, and if they are not well broken and well mannered they may be rejected and have to be resold. This is another advantage of selling the 5 and 6-year-olds rather than 3's or 4's.

Only well broken horses should be sold to dealers or shipped to markets. The farm is the place to train young horses rather than in the cities or on construction jobs. Breaking is not so important when horses are sold from one farmer to another, but is essential when horses are sold on the markets.

SOUNDNESS

Sound horses always sell more readily and for higher prices than unsound ones. The most serious unsoundnesses are: Ring-bones, bone spavins, side-bones, cock ankles, curbs, bog spavins,

thoroughpins, and periodic opthalmia. On draft horses valued from \$200 to \$250, when sound, one of the above unsoundnesses would mean a reduction in price of \$20 to \$75, depending upon the nature of the unsoundness. Buyers are becoming more discriminating and unsound horses are difficult to sell at satisfactory prices. In many cases, big draft horses of good type sell as loggers because they have an unsoundness. Farmers who produce unsound horses should not expect as high prices as the man who raises the good sound horse.

MULTI-HITCHES



Fig. 12. A buck strap and rope and a 5-foot tying-in chain. Dimensions of buck strap are: inside check 48 inches; outside check 54 inches with a 10-inch connecting chain and an 84-inch single strap which snaps to the draw chain.

—Courtesy Horse Association of America.

The use of multi-hitches is increasing rapidly in the Corn Belt states. These hitches are modifications of the large team hitches used in the great wheat producing sections of the Northwest. They are well adapted to use in pulling plows, discs, binders, corn pickers and combine harvesters. The only equipment needed, in addition to good equalizers, is a "bucking back" strap or rope and "tying in" chain (figs. 12 and 13).

In "tying in" a light coil chain five feet long with a bolt snap in each end is used. One end is snapped into the halter ring and the other end to the heel chain of one of the lead horses, usually the horse directly in front.

The buck strap or rope, which is made on the same principle as a line, is run thru the hame rings and snapped into the bit rings. From the withers the single strap or rope runs downward, fastening to the draw chain near the horses' hind legs. When three or more horses are bucked back, only two can

be fastened to the draw chain, but the others can have their bucking back straps fastened to the heel chain or tug of the horses already fastened to the draw chain.

If the rear horses have a tendency to go too fast, they should have their buck straps shortened, while if they have a tendency to hold back, their tying-in chains should be shortened to make them walk up in place.

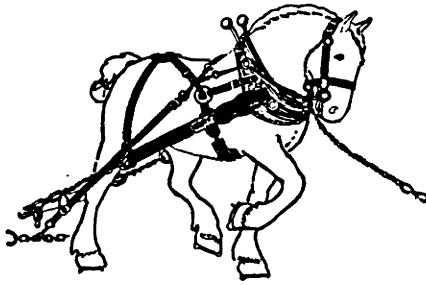


Fig. 13. Showing use of the buck strap and lead chain—the lead chain should be snapped to the halter or halter bridle.

—Courtesy Horse Association of America.

The use of multi-hitches makes it possible to drive any number of horses with one pair of lines and also to regulate big teams so that each horse must do his full share of the work but no more. It also makes it possible to hitch horses on a true line of draft from plows, thus doing away with side draft, which is unproductive. The multi-hitch is the simplest and most efficient method ever devised for driving four or more horses on plows. It is simple because all the driving is done with one pair of lines and efficient because each horse must do his full share of the work.

The advantages of multi-hitches are:

1. All horses are under complete control which simplifies driving four or more.
2. The efficiency of the horses is increased because they can be hitched on a true line of draft from the plow, thus eliminating side draft.
3. Horses can be worked with very little crowding or tramping, which makes them more contented.
4. Horses can be kept cooler because they can be strung out and still kept under perfect control.
5. By pulling straight away from the plows horses are not so apt to get sore shoulders and necks.
6. Multi-hitches encourages the use of horses, which means the use of power produced on the farms and fed on farm products. Horses convert oats, corn and hay into a cheap, dependable form of power, and they also help to maintain soil fertility. It is not necessary to use the returns from the sale of a cash product to buy fuel. Horses turn the crude farm feeds into productive power.

One of the commonest hitches found in the Corn Belt is four horses abreast on a sulky or gang plow. This is a very inefficient hitch because the horses are crowded, those on the inside get hot and there is a great deal of side draft developed since two horses must work at an angle. The efficient way to work four

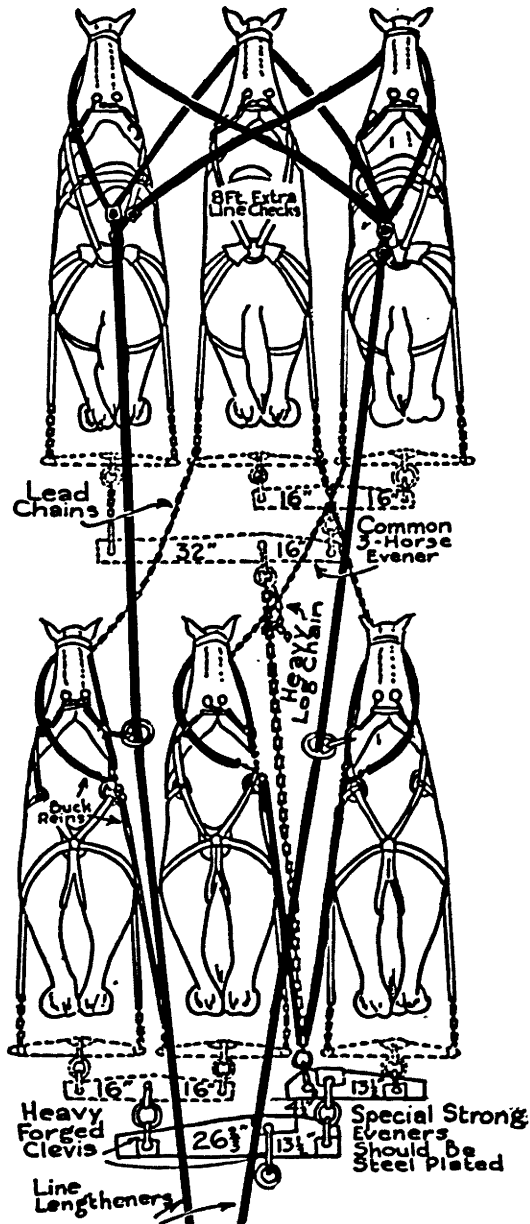


Fig. 14. Details of a 3-and-3 hitch. This drawing shows how the buck straps and lead chains are used. The 8-foot extra checks, which are used to drive the lead horses, are also illustrated.

horses is to hitch them two and two, with lines to the front team and the rear two tied in and bucked back.

A newer hitch is to drive three horses in front and two behind. This hitch allows the rear horses to spread considerably, which makes it easier to watch and drive the lead horses. The disadvantage is that a farmer may have two good lead horses but not three.

A slight adjustment of the eveners permits the addition of another horse, making a six-horse team hitched three and three (fig. 14). This is a very good hitch for heavy plowing. It is advisable to have a little extra power when plowing rather than not enough. An additional horse makes it possible to keep the outfit moving steadily all day without frequent rest periods. A little extra power also makes it possible to fasten a section of a harrow on the plow and thus complete two operations at one time. Eight, nine and twelve-horse teams can be handled as efficiently as the five and six.

A detailed bulletin on multi-hitches can be obtained from the Horse Association of America, Union Stock Yards, Chicago, Illinois.